NSERC's HQP Strategy

Final Report – December 2005

Introduction

In June 2003, NSERC Council adopted a five-year strategy for highly qualified people (HQP) outlined in *Investing in People – An Action Plan*. The HQP Strategy was developed following five workshops that NSERC sponsored across Canada in the context of the Government's Innovation Strategy consultations. The purpose of the workshops was to learn from key stakeholders how NSERC could help double the graduation rates of HQP in science and engineering. The Strategy identified various actions NSERC could consider to ensure a reliable supply of highly-skilled people in support of Canada's transition to a 21st century knowledge economy. The proposed initiatives included items for early action, ongoing initiatives and proposals requiring further consideration and analysis.

This report presents progress on NSERC's sustained efforts to implement the initiatives outlined in the Strategy. The original time frame for implementation was five years. However, as of November 2005, NSERC has completed over 80 per cent of the identified actions and is in a position to bring closure to the Strategy, and related progress monitoring, as a discrete exercise. Certain elements of the Strategy are still ongoing and have become an integral part of pilot initiatives under the NSERC Vision. Other outstanding items have largely been integrated into current planning frameworks, such as *Realizing the Benefits*, a strategic plan for NSERC's Partnerships Programs Directorate, as well as the ongoing development of an International Strategy for NSERC.

Context

A key target of the Innovation Strategy was to rank Canada among the top five countries in terms of R&D expenditures per capita. Implicit in this goal is a requirement for "more than 120,000 new research scientists and engineers" by 2010.[1] NSERC's role is to support the development of these HQP through its investments in people, discovery and innovation. In this regard, NSERC's HQP Strategy made important contributions to the implementation of the Government of Canada's Innovation Strategy, of which NSERC was an integral part.

NSERC's HQP Strategy had four objectives:

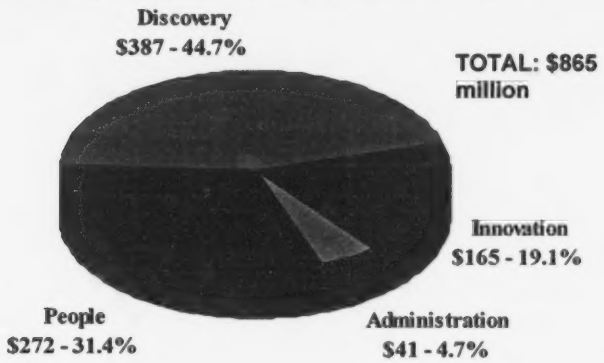
1. To increase the pipeline of young people interested in science and engineering;

[1] NSERC Internal Report: *An Analysis of the Supply/Demand Conditions to 2010 for R&D Personnel in the Sciences and Engineering*, June 2002.

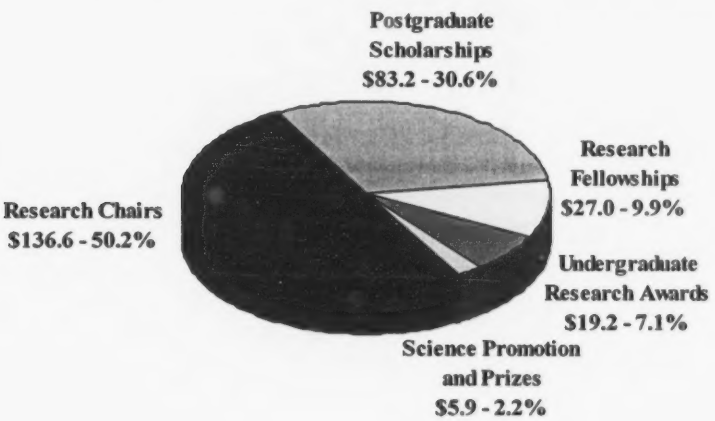
2. To ensure that Canada develops a skilled and talented labour force to satisfy the anticipated demand for HQP in all sectors of the Canadian economy;
3. To ensure Canadian research is world-class and internationally competitive and thus can provide a stimulating and relevant training environment, as well as employment opportunities, for the next generation of scientists and engineers; and
4. To facilitate a coordinated funding environment for the research community.

The Government of Canada has been committed to the development of HQP through its support of NSERC, with annual budget increases and the launch of the Canada Graduate Scholarships (CGS) program. NSERC received an increase of $39 million in 2004 and an increase of $32 million in 2005, bringing NSERC's total budget for 2005-06 to $865 million. The allocation of NSERC's total budget is presented in the figures below.

NSERC Budget 2005-06 (millions of dollars)



People Programs Planned Budget 2005-06 (millions of dollars)



TOTAL: $272

The 2004 and 2005 budget increases have allowed for additional funding in areas related to the objectives of the HQP Strategy. For example, funding has been directed towards:

- **New Researchers** – Funding for new applicants to the Discovery Grants program was increased by $15.5 million in 2004-05 and by $18.5 million in 2005-06.
- **Research with Industrial Relevance** – A $5 million increase was introduced for the Industrial Research Chairs and Collaborative Research and Developments Grants (CRD) programs in 2004-05.
- **Postgraduate Students and Postdoctoral Fellows** – A $1.6 million increase for the Industrial Postgraduate Scholarship (IPS) Program and a $0.4 million injection started in 2004-05 for the Industrial Research Fellowships (IRF) program – now known as the Industrial Research and Development Fellowships (IRDF) program. Recipients of Canada Graduate Scholarships benefit from the increased stipend levels provided under this program. With dedicated CGS funding announced in Budget 2003, NSERC will support an additional 600 master's and 600 doctoral students per year once this program is fully implemented in 2006-07.
- **Commercialization of publicly funded research** – NSERC has committed to tripling its investments by 2006-07 (as compared to 2003-04 budget levels) in programs that support the commercialization of publicly funded research, such as the Intellectual Property Management program – now known as the Intellectual Property Mobilization (IPM) program and the Idea to Innovation program (I2I).

Reporting on Action Items

The actions that NSERC has undertaken towards meeting the objectives of the HQP Strategy were first outlined in an annual report to Council in June 2004.[2] The annual report identified items that were still ongoing or required further consideration. Since then, most remaining action items have been completed, as outlined in the following tables, while others have been integrated into ongoing initiatives or strategic plans. The table also features a number of new initiatives **(shown in shaded cells)** that are relevant to the objectives of the HQP Strategy and were proposed and initiated after the Action Plan was adopted in June 2003.

[2] NSERC's HQP Strategy - *June 2004 Annual Report,* June 2004.

Objective #1: Increase the pipeline of young people interested in science and engineering

Activities	Specific Action	Status	Details
1.1 Increase the participation of children and youth in science promotion activities, enhance their interest in science and math, and improve our understanding of science and math education as well as the training and resources dedicated to it in order to help build a science culture in Canada.	Increase investments in the PromoScience Program.	Done	The annual budget has increased to $2.75 million for 2005-06 from $2 million in 2003-04, a 38 per cent increase.
	Launch pilot program in spring 2004: Centres for Research in Youth, Science Teaching and Learning (CRYSTAL).	Done	This program provided funding, in 2005-06, of up to $200,000 per year (max. five yrs) for centres at the University of Alberta, the University of New Brunswick, Université de Sherbrooke, the University of Manitoba and the University of Victoria. The University of Alberta also acts as a national leader to coordinate the centres as a network.
1.2 Expose more science and engineering undergraduate students to research and development (R&D), stimulate their interest in R&D and influence their decision to continue on to graduate studies.	Increase the number of Undergraduate Student Research Awards.	Done	The total number of awards available to eligible Canadian universities increased from 2,780 in 2002-03 to 3,507 in 2005-06 (a 26 per cent increase). Additionally, industry-based awards were increased from 681 in 2002-03 to 789 in 2005-06 (a 16 per cent increase).

Objective #2: Ensure that Canada develops a skilled and talented labour force to satisfy the anticipated demand for HQP in all sectors of the Canadian economy

Activities	Specific Action	Status	Details
2.1 Encourage more students to pursue advanced degrees.	Increase the value of NSERC Postgraduate Scholarships provided to doctoral students (PGSD), as well as the value of Industrial Postgraduate Scholarships (IPS).	Done	In 2003-04, PGSD awards were increased from $19,100/yr to $21,000/yr and IPS awards were also increased to $21,000/yr for both master's and doctoral levels.
	Implement NSERC's portion of the Canada Graduate Scholarships program, which provides increased stipends for masters (CGSM) and doctoral students (CGSD).	Done	At the master's level, the $17,500/yr CGSM awards have been provided to 533 master's students in the 2005 competition. At the doctoral level, the $35,000/yr CGSD awards have been provided to 280 doctoral students in the 2005 competition. Once fully implemented in 2006-07, NSERC will support 600 master's and 600 doctoral students per year through the CGS program.

Activities	Specific Action	Status	Details
2.2 Support postdoctoral fellows to continue their research work in an academic setting to help address the projected faculty renewal in the next five to 10 years as many professors retire.	Increase the value of Postdoctoral Fellowships (PDF).	Done	In 2003-04, PDFs were increased from $35,000/yr to $40,000/yr.
	Consider increasing the number of Postdoctoral Fellowships	Done	Further to the implementation of the CGS program, NSERC investigated whether a redistribution of awards between the postgraduate and postdoctoral levels would be appropriate. Since 2003-04, the budget for postdoctoral fellowships (including industry-based awards) has increased 16 per cent to $22 million in 2005-06; however, the change did not significantly affect the success rate due to an increase in the number of applicants to the two programs. The success rate remains approximately 30 per cent.
2.3 Enable Canadian students to access the best research facilities abroad to enrich their training, by developing new bilateral and multilateral agreements and by promoting the participation of Canadian students in existing	Implement agreements with Japan and Taiwan for summer research experiences.	Done	Summer 2005 marked the third year of Canadian participation in the Japan program and the second year for the Taiwan program. In 2005, NSERC received 63 applications for 13 available awards.
	Develop a comprehensive International Strategy for NSERC.	Ongoing	An International Strategy will provide the framework within which NSERC can act on international opportunities for the development and training of HQP. In fall 2005, NSERC Council approved the creation of an Advisory Committee to further the development of the strategy.

Activities	Specific Action	Status	Details
programs that support student mobility for graduate studies and research training.	Promote Canadian participation in the Marie Curie International Fellowships under the European Union's Sixth Framework Program, by raising awareness of the program.	Done	The program continues to be promoted through various fora, in particular the new S&T cooperation initiative to improve linkages between Canada and the European Research Area. The ERA-Can Project, to which NSERC is a contributing partner, will open an office in Canada in 2006.
	Support Canadian participation in the *Math in Moscow* program	Done	The *Math in Moscow* program is a unique opportunity for gifted Canadian math students to spend four months studying with other top students and with leading Russian mathematicians. Students are selected through a competition administered by the Canadian Mathematical Society (CMS) and for the past three years, NSERC has contributed $7,500 per year per student to CMS to support three scholarships. CMS contributed an additional $2,500 per student in order to provide a scholarship of $10,000, which helps to defray tuition (US$4,000), travel and living costs during the four month program.
	Promote awareness of existing agreements with Japan and the United Kingdom among Canadian students to increase their participation in competitions.	Done	In 2005, NSERC met its quota for the Japan Society for the Promotion of Science (JSPS) PDF for the second year in a row, 20 applications were received and 15 awardees were selected. Ten Canada-UK Millenium Award supplements will be offered for 2005-06. Furthermore, NSERC

Activities	Specific Action	Status	Details
			promotes the Royal Society of London's new (as of winter 2006) program for short-term visiting fellowships in the UK, available to North American postdoctoral fellowship holders.
	Increase NSERC's knowledge of facilities and expertise abroad, and determine methods and incentives to encourage more Canadians to become research students in excellent laboratories abroad.	Ongoing	An editorial in the June 2003 NSERC *Contact* was the first step to solicit input for expanding NSERC's knowledge of excellent labs throughout the world. NSERC has compiled the responses received. In keeping with the federal government's intent to increase linkages with emerging market countries, NSERC Council approved in fall 2005 the creation of a Canada-India Working Group that will examine possible mechanisms for the exchange of HQP between Canada and India, initially on a pilot basis.
2.4 Help ensure that students in Canadian universities complete their graduate work in a shorter timeframe by developing a better understanding of student experiences and the factors that influence completion times and attrition rates.	In collaboration with the Canadian Association for Graduate Studies (CAGS), report on the results of several surveys and recommend policy actions to improve graduate production in Canada while maintaining current high standards.	Done	CAGS report released in October 2003 includes 12 recommendations to decrease time to completion and reduce attrition rate in graduate programs. The report can be found at http://www.cags.ca/publications/publications.html.

Activities	Specific Action	Status	Details
2.5 Determine why research fellows do not return to Canada and what incentives would entice them to do so by conducting surveys of NSERC-funded postdoctoral fellows (PDFs). Based on the survey findings, identify mechanisms to encourage more NSERC-funded Canadians doing advanced study and research abroad to maintain links with the Canadian research community and, ultimately, return to Canada.	Develop new programs and policies that will influence decisions by PDFs to return to Canada.	Done	NSERC conducted an international environmental scan for model programs and/or policies in the area of PDF repatriation. Ultimately, Council decided that action on a program basis was not required because evidence suggests that holding a PDF award abroad does not necessarily result in fellows remaining abroad and, furthermore, other programs such as the Canada Research Chairs are successfully repatriating Canadians. A well funded research environment is more paramount for attracting/retaining HQP in Canada.
	Help Canadian universities in their faculty and graduate student recruitment processes, and help NSERC award holders abroad to identify employment and graduate studies opportunities in Canada.	Ongoing	NSERC will be providing universities with information about NSERC award holders, if the award holder authorizes NSERC to do so by checking a box on the award acceptance form. NSERC already provides Canadian embassies with public information about host institutions of PGS and PDF award-holders abroad on an annual basis. This enables the embassies to conduct outreach to Canadians abroad for science-related activities, in order to maintain their awareness of developments in the S&T environment in Canada.
	Consider a PDF Repatriation Initiative	Done	On a pilot basis, a reimbursement of $1,000 covered 30-100 per cent of a participant's travel and registration costs for nine internationally based NSERC PDF holders to attend a chemistry conference in Canada. However, NSERC Council

Activities	Specific Action	Status	Details
			decided that support on an ongoing basis to fund travel or networking of PDFs for conferences or meetings, was not optimal and would not provide sufficient incentive for fellows to return to/stay in Canada; moreover, such support is generally available through the PDF supervisor's research funding.
2.6 Identify mechanisms to attract HQP to Canada, as well as mechanisms to provide them with direct links to Canadian industry.	Explore the development of programs to expose foreign students to the Canadian research environment.	Ongoing	To be addressed in the course of reciprocity discussions with Japan and Taiwan, and the consideration of initiatives with South Korea and India. External factors such as more stringent visa requirements for entry into the USA may provide an opportunity for Canada to better attract HQP to Canada. In 2005, the federal government announced that pilot projects already in effect in Manitoba, New Brunswick and Quebec allowing foreign students to work part-time off campus will be extended across the country subject to finalizing negotiations with all provinces.[3] Since May 2005, foreign students are also eligible for a post-graduation work permit of up to two years, although two year permits are issued only if employment is outside of the Communauté

[3] Fusano, H., Foreign students are human, too. *University Affairs*, August-September 2005.

Activities	Specific Action	Status	Details
			métropolitaine de Montréal, the Greater Toronto Area, or the Greater Vancouver Regional District.[4] These policy changes will promote foreign HQP intake and will also allow Canadian universities to better compete with universities in other countries to attract foreign students.

Objective #3: Ensure Canadian research is world-class and internationally competitive and thus can provide a stimulating and relevant training environment, as well as employment opportunities, for the next generation of scientists and engineers

Activities	Specific Action	Status	Details
3.1 Enable professors in Canadian universities to work in an internationally competitive research environment.	Provide adequate funding for the large numbers of newly appointed professors who are first-time applicants to the Discovery Grants program.	Done	New funds allocated for first-time applicants (permanent increase to Discovery Grants budget): 2003-04 = $12.5 million 2004-05 = $15.5 million 2005-06 = $18.5 million

[4]Citizenship and Immigration Canada, Study in Canada: Work Opportunities for Foreign Students, http://www.cic.gc.ca/english/study/work-opps.html#postgrad

Activities	Specific Action	Status	Details
	Continue to support researchers who have proven themselves to be productive and excellent, and who will provide additional funding to support more graduate students.	Done	Funds added to Discovery Grants budget noted above aim to ensure that grantees seeking funding renewals who continue to conduct excellent research in Canada's universities are funded at an adequate level.
	Ensure that university professors and students have the tools, instruments and access to facilities necessary to undertake their research.	Done	In 2004, the Major Facilities Access (MFA) program budget received a $6 million increase.
	Allow university professors to seize special research opportunities.	Done	The Special Research Opportunities program was created in 2003. The 2005 budget is $10.4 million and the planned investment for 2006 is $11.4 million.
3.2 Help strengthen Canadian industrial R&D capacity.	Provide additional funding to university-industry partnership programs in the Research Partnership Programs (RPP) Directorate.	Done	Additional funding to RPP programs from $6 million in 2003 to $15 million in 2004.
	Increase the value of Industrial Postgraduate Scholarships.	Done	The value of the IPS awards were increased from $19,100/yr to $21,000/yr for both master's and doctoral levels.

Activities	Specific Action	Status	Details
3.3 Enable professors in Canadian universities to work in an internationally competitive research environment.	Enhance support for researchers who have proven themselves to be productive and excellent, and who will provide additional funding to support more graduate students.	Done	Funds added to Discovery Grants budget, noted above under 3.1, aim to ensure that grantees seeking funding renewals and who continue to conduct excellent research in Canada's universities are funded at an adequate level.
3.4 Expose students and fellows to the opportunities available in Canadian industry and help train students and fellows in science and engineering areas that are relevant to Canadian industry.	Increase the number of Industrial Postgraduate Scholarships (IPS) and Industrial Research Fellowships (IRF) – now known as Industrial R&D Fellowships (IRDF).	Done	Since 2003-04, there has been a 12 per cent increase in the budget for the IPS program ($5.4 million in 2003-04 to $6.0 million in 2005-06). The 2005-06 IPS budget will support approximately 400 awardees. Since 2003-04, there has been an 18 per cent increase in the budget for the IRF program ($4.2 million in 2003-04 to $5.0 million in 2005-06). The 2005-06 budget will support approximately 250 awardees. As of September 2005, NSERC has shortened the response time from three months to six weeks for applications. The scope of the program has also been broadened to allow awardees "to dedicate a greater portion of their time to 'technology inflow activities.'"
	Help to keep NSERC in closer touch with its clients' needs, build stronger ties with local communities, and facilitate access to NSERC programs	Done	The first regional office, serving Atlantic Canada, opened in Moncton, New Brunswick in July 2004, and the NSERC Prairie regional office in Winnipeg, Manitoba started operating in September 2005. Future offices in the West, in Ontario and in Quebec are currently being planned.

Activities	Specific Action	Status	Details
3.5 Expand opportunities for the training of technology-transfer specialists to facilitate the commercialization of university research.	Increase NSERC's contribution to the tri-agency Intellectual Property Mobilization Program (IPM).	Done	NSERC's contribution to the IPM program has risen from $2.8 million in 2003-04 to $4.6 million in 2005-06. By 2006-07, the NSERC portion of the IPM budget is forecast to rise to $8.0 million (a 186 per cent increase from 2003-04). In 2005, 24 "Group" and eight "Internship and Technology Transfer" applications were received, and the Panel recommended funding for 16 of the group applications and six internship applications.
3.6 Ensure that new graduates in the natural sciences and engineering domains acquire the appropriate mix and quality of technical and non-technical skills over the course of their study.	Develop appropriate programs and policies.	Initiated	The first step in the Action Plan was to identify the skills required by graduates in the natural sciences and engineering domains. Since 2003, a student session addressing best practices in training HQP has been held at the Networks of Centres of Excellence's (NCE) annual meeting. The 2005 annual meeting will take place in December and new information exchanged at this session may be incorporated in the NCE's HQP Best Practices document, which is provided to funded networks.
	Improve training in partnership with universities, businesses, and provincial granting agencies, drawing on models such as the US National Science Foundation's Integrative Graduate Education and Research Traineeship	For further consideration	The Standing Committee on Research Partnerships (CRP) has looked to address the perceived lack of connection between academic experience and industry needs in science and engineering and the lack of non-technical skills of graduates. Potential actions have been identified and recommendations made to the Scholarships and Fellowships Directorate regarding industry-based scholarships and

Activities	Specific Action	Status	Details
	Program (IGERT), the Canadian Institutes of Health Research's Strategic Training Initiative and the Research Training Groups program of the German Research Foundation (DFG).		fellowships. As the Research Partnerships Directorate continues to refine its *Realizing the Benefits* strategy, it will identify priority actions to expand the business skills of science and engineering graduates, in consultation with the Scholarships and Fellowships Directorate, and bring recommendations to CRP and the Committee on Grants and Scholarships. In the Scholarships and Fellowships Directorate, proposals are under development for potential NSERC support to new and innovative graduate programs. Plans were discussed with NSERC Council in October 2005 and further consultation with stakeholder groups will be conducted to assess the potential role of NSERC. The broad objectives are to support programs for interdisciplinary and collaborative research training, broad skill set development and innovative curriculum design and delivery.

Activities	Specific Action	Status	Details
3.7 Explore how NSERC might assist Canadian colleges to be more effective participants in regional innovation and economic development, based on its evaluation of the research and innovation capacity of Canadian colleges acquired through site visits to colleges across Canada. (This evaluation was conducted in collaboration with the Association of Canadian Community Colleges in Fall 2002.)	Propose, for additional funding by the federal government, new programs and policies that are in keeping with any future federal government plans regarding support for the college system in Canada.	Ongoing	The College and Community Innovation Pilot Program was launched in 2004, with an investment totalling $2.4 million over the next three years to support innovation initiatives by community colleges and institutes of technology and Quebec's CEGEPs. In Fall 2004, NSERC announced the results of the pilot competition. The following colleges were announced as awardees. • British Columbia Institute of Technology, BC • Cégep de Lévis-Lauzon, QC • Niagara College, ON • Nova Scotia Community College – Annapolis, NS • Olds College, AB • Red River College, MB

Objective #4: Facilitate a coordinated funding environment for the research community

Activities	Specific Action	Status	Details
4.1 Minimize the time a researcher (or student) spends applying for funding and peer reviewing funding proposals.	Continue to collaborate with federal and provincial partners in administering research funds and consider synergies with other organizations when developing programs and policies.	Done	NSERC's Discovery Grants program now offers a five-year grant duration in order to reduce application and peer review workload. The change from a four year to a five year grant duration was implemented in 2004-05. NSERC's eBusiness initiative is continuing to enhance its on-line application and review mechanisms. Recent available data shows that 82 per cent of applications were submitted electronically for the upcoming 2006 Discovery Grants and RTI competition. The proportion of applications submitted electronically has risen each year since the introduction of the eSubmission system in 2002. Extranets are also playing an important role in lightening the burden for the research community. Extranets started as sites for posting information, but they are rapidly evolving into communications-sharing tools, with six sites being launched in March 2005: the Council's Executive Committee site; the Idea to Innovation Selection Committee site; the NSERC Representatives site; the Research Networks Principal Investigators site; the Scholarships and Fellowships Selection Committee site; and the

Activities	Specific Action	Status	Details
			Discovery Grants Selection Committee site. E-Business also continues to work on increasing the commonality of the Common CV system and improving core functionalities.
	Consolidate the Collaborative Research Opportunities (CRO), International Opportunity Fund (IOF), and Strategic Project Grants' (SPG) New Directions programs into the Special Research Opportunities (SRO) program.	Done	The SRO program was created in 2003. The 2005 budget is $10.4 million and the planned investment for 2006 is $11.4 million.
	Collaborate with granting agencies and the Canada Foundation for Innovation (CFI) in the 2005 International Joint Venture Project competition.	Ongoing	The granting agencies and foundation adopted a collaborative approach for the review, selection and funding of one more International Joint Venture. The goal is to enable simultaneous consideration of the funding of infrastructure and research costs to avoid duplication in the application and peer review processes.
	Participate in Treasury Board Secretariat Review of Canada's Biotechnology Strategy.	Done	One aim was to identify areas of potential overlap within government S&T. Other horizontal reviews are planned by TBS.

Conclusion

This report has outlined NSERC's sustained efforts to implement the initiatives outlined in the HQP Strategy, including actions in each of the Strategy's four broad thematic areas, in support of the Government's Innovation Strategy.

Canada's future growth and prosperity depend on the ability of Canadians to harness the potential of science and technology. In this context, NSERC's success in implementing the HQP Strategy in three years is very significant. The timely implementation of the majority of actions is also attributable to increases to NSERC's budget in recent years, which have supported additional funding for research and training in the natural sciences and engineering.

NSERC remains committed to enhancing the quality and supply of HQP throughout Canada and will continue to promote the broad objectives of the HQP Strategy, in partnership with other stakeholders where appropriate, and develop policies and strategies over time to achieve the necessary outcomes for Canada.

References:

NSERC's HQP Strategy: *Investing in People – An Action Plan*, July 2003.

NSERC Internal Report: *An Analysis of the Supply/Demand Conditions to 2010 for R&D Personnel in the Sciences and Engineering*, June 2002.

NSERC's HQP Strategy - *June 2004 Annual Report*, June 2004.